

U.S. Health and Human Services

Office of the National Coordinator for Health IT

Query Format (HQMF) Implementation Guidance

3/30/2012

Revision History

|  |  |  |
| --- | --- | --- |
| Date | Document Version | Document Revision Description |
| 02-06-2012 | v0.1 | Initial document creation and internal review |
| 03-30-  2012 | V0.2 | Incorporated comments made by Marc Hadley. |
| 05-01-2012 | V0.5 | Incorporated feedback from F2F and rearranged the document. |

Acknowledgements

The authors of this document wish to recognize the following participants who contributed their time and expertise to the development of this guide.

***Query Health Technical Working Group members to be listed below:***

Special thanks go to the following individuals who have so graciously and diligently volunteered their time to make this implementation guidance a reality:

* Keith Boone, GE Healthcare
* Marc Hadley, MITRE
* Jeff Brown, PopMedNet

Copyrights

This material includes materials from the HQMF (Health Quality Measures Format) standard, Query Health Use Case, and Query Health Technical Approach Documents. **All materials used in this document are used for prototype and development purposes ONLY, with permission from HL7.**

Table of Contents

[1. Introduction 7](#_Toc323707270)

[1.1. Query Health Overview 7](#_Toc323707271)

[1.2. Health Quality Measures Format (HQMF) as Query Format 8](#_Toc323707272)

[1.2.1. Benefits of HQMF 8](#_Toc323707273)

[1.2.2. Drawbacks of Existing HQMF 9](#_Toc323707274)

[1.3. Document Purpose 9](#_Toc323707275)

[1.4. References 10](#_Toc323707276)

[1.5. Conventions Used 10](#_Toc323707277)

[1.5.1. Namespaces 10](#_Toc323707278)

[1.5.2. Use of Conformance Language 11](#_Toc323707279)

[2. HQMF Key Concepts For Query Health 11](#_Toc323707280)

[2.1. HQMF and eMeasure 11](#_Toc323707281)

[2.2. HQMF and Distributed Queries 12](#_Toc323707282)

[2.3. Query Measure Period 12](#_Toc323707283)

[2.4. Data Criteria 12](#_Toc323707284)

[2.4.1. Filters and Data Criteria 13](#_Toc323707285)

[2.4.2. Time Relationships and Data Criteria 13](#_Toc323707286)

[2.4.3. Value Sets and Data Criteria 13](#_Toc323707287)

[2.5. Population Criteria 13](#_Toc323707288)

[2.5.1. Population Criteria and Data Criteria 15](#_Toc323707289)

[2.6. Stratifier Criteria 15](#_Toc323707290)

[2.7. Query Health Clinical Element Data Dictionary and HQMF 15](#_Toc323707291)

[3. HQMF Query Structure 16](#_Toc323707292)

[3.1. HQMF Header 17](#_Toc323707293)

[3.1.1. Document Level Elements 17](#_Toc323707294)

[3.2. HQMF Body 19](#_Toc323707295)

[3.2.1. Measure Parameters 20](#_Toc323707296)

[3.2.2. Measure Description Section 22](#_Toc323707297)

[3.2.3. Data Criteria 22](#_Toc323707298)

[3.2.4. Population Criteria 38](#_Toc323707299)

[4. Putting It Together – Working HQMF Queries 44](#_Toc323707300)

[5. Appendix A - HQMF Enhancement Status – March 2012 44](#_Toc323707301)

[5.1. Proposed HQMF Enhancements – Status as of April 2012 45](#_Toc323707302)

[6. Appendix B - Acronyms and Definitions 54](#_Toc323707303)

List of Tables and Listings

Table 1 - HQMF Namespace Prefixes 10

Table 3.2.3.6-1 - Allowed Subset codes in HQMF Query Format 29

Listing 3.2.3.6-2 – Example showing subset and excerpt elements 30

Listing 3.2.3.6-3 – Example showing excerpt, subset elements 30

Table 24 - Proposed HQMF Enhancements – Status as of April 2012 52

Table 25 - Key Acronyms and Definitions from HQMF 54

Table of Figures

[Figure 1.1 – Query Health Overview 7](#_Toc323707313)

# Introduction

In support of the national objectives for healthcare reform, the Office of the National Coordinator for Health Information Technology (ONC) Standards and Interoperability (S&I) Framework has sponsored the development of harmonized specifications in support of the Query Health initiative. These specifications are collectively referred to as the Query Health Technical Approach, and are designed to support national health initiatives and healthcare priorities, including Meaningful Use, the Nationwide Health Information Network, and the ongoing mission to improve population health. The specifications developed to date include:

* Query Health Clinical Element Data Dictionary (CEDD) Specification
* **Query Health Query Format Specification**
* Query Health Query Result Specification
* Query Health Query Envelope Specification
* Query Health Query Catalogs

This document will serve as an implementation guidance document for the Query Health – Query Format Specification. The next section provides an overview of Query Health specifically focusing on the Query Format specification and its purpose.

## Query Health Overview

The nation is reaching a critical mass of Electronic Health Records (EHRs) that comply with data and vocabulary standards. The wide deployment of EHRs creates an opportunity to aggregate health care data to provide a broad range of benefits that can contribute towards improved health of individuals and the population as a whole. A common method for querying data sources is critical to enabling and simplifying data aggregation across widely distributed EHR systems. The Query Health Initiative is developing the standards to enable distributed queries of data sources for a variety of purposes.   
There are a number of important uses for distributed queries, including quality measures, disease outbreaks, comparative effectiveness analysis, efficacy of drug treatments and monitoring health trends. These are largely supported today by extracting data from source systems and integrating it into a centralized database where queries and analysis are managed. The Query Health Use Case moves away from the centralizing tendency to “bring the data to the questions” to distributed population queries that “bring questions to the data.” The Query Health approach is outlined in the Figure 1.1 below.

As shown in the figure, an Information Requestor creates a query and distributes it to a data source, where the query is executed behind the firewall of the organization which controls the data. Once the aggregate results are finalized, they are then returned back to the Information Requestor while the patient level data remains behind the firewall. The Query Health standards and specifications developed will allow the owners of the data to authorize queries and results using organization specific workflows. The Query Format Specification being discussed in this Implementation Guide is part of Step 3 in the diagram where queries are created and distributed to the data sources. The Query Format specification standardizes the format in which queries are expressed.

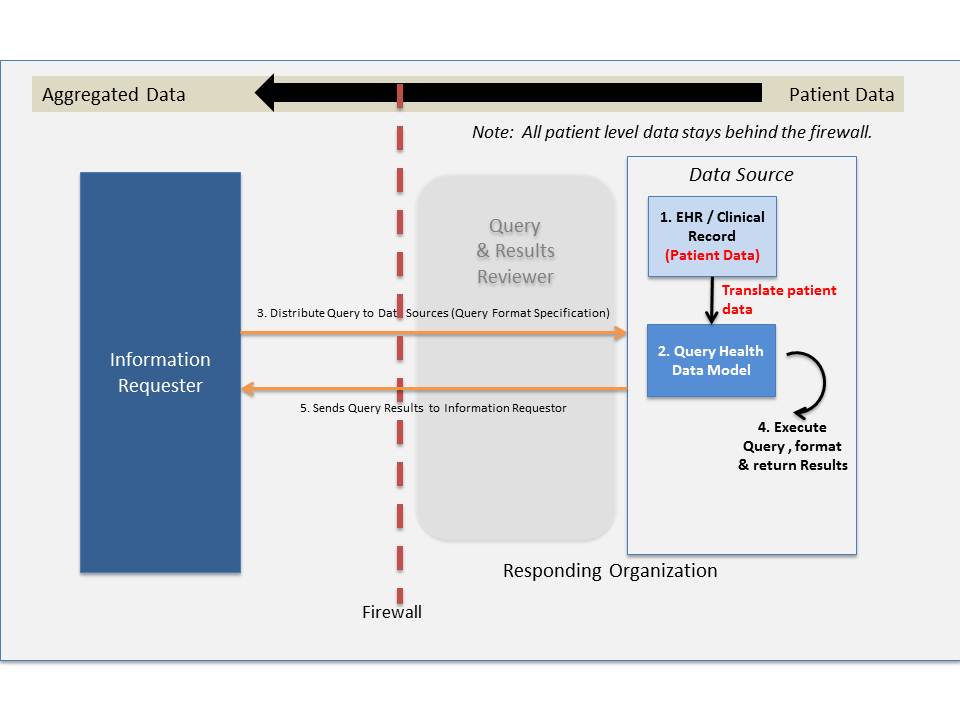


Figure .1 – Query Health Overview

## Health Quality Measures Format (HQMF) as Query Format

The Query Health Technical Working Group, after extensive industry scan, analysis, and prototyping has adopted the Health Level 7 (HL7) Health Quality Measure Format (HQMF) standard for representing distributed queries. In other words HQMF will serve as the standard for how a query is constructed including standard codes and vocabularies.

### Benefits of HQMF

HQMF was chosen as the primary standard for query formats because it provides many benefits to the Query Health initiative. These benefits include:

* **Flexibility** 
  + HQMF can express queries in a declarative format independent of the implementation language. This was a significant factor in deciding to use HQMF because a declarative format
    - Allows multiple technology platforms to implement the declarative standard
    - Allows for a more secure query to be distributed when compared to procedural languages such as SQL, Java Script.
  + HQMF enables the expression of a large majority of queries related to Meaningful Use (MU), Accountable Care, Comparative Effectiveness, Population Measures, and clinical research- related queries.
  + HQMF is already in use for eMeasures, which are a critical component of the workflow to support Meaningful Use, and can be tailored and reused for distributed queries, increasing vendor adoption.
* **Usability**
  + eMeasures are understood by providers to guide optimal care, and to guide collection of Electronic Health Record (EHR) and other data, which is then assembled into quality reports. Leveraging the data collected for eMeasures will foster adoption of Query Health as the data can from existing workflows can be reused for distributed queries.
* **Standardization**
  + HQMF allows the Query Health initiative to standardize a query’s structure, metadata, definitions, and logic, enabling query consistency and unambiguous interpretation.
    - Streamlines implementation of queries and reduces the burden of manual data collection and reporting.
    - Enhances the use of nationally-recognized performance measures developed by NQF and CMS at the point of care, which enables greater transparency for providers and consumers.

### Drawbacks of Existing HQMF

The existing HQMF standard which is used as part of eMeasures has a few drawbacks that need to be understood by implementers. Foremost among these drawbacks are

* Existing HQMF allows both structured and non-structured data which makes the standard non computable.
* Representing queries in the existing standard is not easily understood by developers without having a deep knowledge of HL7 Reference Information Model (RIM).

In order to foster Query Health standards and specifications, it is imperative to ensure that the standards are computable, easily understood and have robust reference implementations that showcase how the standard can be used in the real world. As a result a number of enhancements to the existing HQMF have been identified and are documented in Appendix 7.1

## Document Purpose

The purpose and value of this implementation guidance document is to provide specific implementation guidance around the usage of HQMF within the Query Health initiative. This specification will identify the common minimum query format for expressing a large majority of queries across Query Health implementations. Specifically, the focus is on:

* Showing how the HQMF implementation in Query Health fully aligns to current and evolving changes to the base HQMF standard.
* Identifying the list of changes required to existing HQMF to support Query Health, with the changes updated weekly to reflect lessons learned through reference implementation piloting.
* Making it easier to build query expressions and translate the queries to implementation languages.
* Identifying the list of constraints that need to be applied to HQMF to support various types of queries
* Demonstrate usage of HQMF using examples.
* The Implementation Guide will be provided to HL7 to support a ballot of the HQMF changes identified by Query Health Initiative in September 2012.

## References

The following are a list of documents that have been used in the creation of this Implementation Guide.

* HL7 Version 3 Implementation Guide: Health Quality Measure Format (HQMF), Release 1
* HQMF Design Document (as developed by HL7)
* IHE Quality Measure Document (QMD) Profile
* HQMF Schema baselined as part of Query Health :
  + <http://code.google.com/p/query-health/source/browse/#hg%2FStandards%2Fhqmf%2Fschemas>
* HQMF Models baselined as part of Query Health:
  + <http://code.google.com/p/query-health/source/browse/#hg%2FStandards%2Fhqmf%2Fmodeling>
* HQMF Samples baselined as part of Query Health:
  + <http://code.google.com/p/query-health/source/browse/#hg%2FStandards%2Fhqmf%2Fsamples%253Fstate%253Dclosed>
* Keith Boone has also developed a guide for usage of HL7 HQMF within the Query Health initiative. That document has been merged into this implementation guidance, and the original document is available here:
  + <http://code.google.com/p/query-health/source/browse/Standards/guidelines/Using%20HL7%27s%20HQMF%20with%20Query%20Health.docx>
* Additional references have been gathered from sources on the Query Health Google Code Repository. An official code repository for the Query Health Reference Implementation has been established using Google. A getting started guide has been developed to help new participants configure their Open Source Code project. The repository can be found at the following site:
  + <http://code.google.com/p/query-health/>

## Conventions Used

### Namespaces

XML examples are included as part of HQMF implementation guidance and use the following namespace prefixes. When no namespace prefix is present, the namespace is assumed to be:

**"urn:hl7-org:v3"** - which is the HL7 Version 3 namespace used by the HQMF specification.

|  |  |  |
| --- | --- | --- |
| **Prefix** | **Namespace** | **Description** |
| (none) | urn:hl7-org:v3 | HQMF |
| xi: |  | Xinclude |
| xsi: |  | XML Schema |
| xsl: |  | XSLT |

Table - HQMF Namespace Prefixes

### Use of Conformance Language

This implementation guide will reuse existing conformance criteria as defined in the existing HL7 HQMF DSTU Specification. Unless otherwise noted, all conformance language from that standard is applicable to this implementation guidance.

The conformance language uses the XML/XPath expressions to designate conformance criteria related to various elements in the HQMF document. Each conformance statement has an Id preceding the conformance language.

For example:

**CONF ex1:** The HQMF query SHALL contain a QualityMeasureDocument/title.

Where CONF ex1 is the conformance requirement Id.

“QualityMeasureDocument/title” indicates the “title” element within the QualityMeasureElement of the HQMF XML.

The keywords SHALL, SHOULD, MAY, NEED NOT, SHOULD NOT and SHALL NOT in this document are to be interpreted as described in the HL7 Version 3 Publishing Facilitator’s Guide. The keyword "SHALL" implies a lower cardinality of 1 but does not disallow NULL values. If NULL values are to be excluded, it will be via an additional explicit conformance statement.

The next section will explain some of the key HQMF concepts before explaining the structure and usage of HQMF.

# HQMF Key Concepts For Query Health

This section defines some of the key HQMF concepts that an implementer should understand before understanding the schema and structure of HQMF. These concepts are further explained in more detail in section 3 and its sub-sections.

## HQMF and eMeasure

The Health Quality Measures Format (HQMF) is a standard for representing a health quality measure as an electronic document. A quality measure is a quantitative tool that provides an indication of an individual or organization’s performance in relation to a specified process or outcome via the measurement of an action, process or outcome of clinical care. Quality measures are often derived from clinical guidelines and are designed to determine whether the appropriate care has been provided given a set of clinical criteria and an evidence base. Quality measures are also often referred to as performance measures or quality indicators.

Through standardization of a measure's structure, metadata, definitions, and logic, the HQMF provides for quality measure consistency and unambiguous interpretation. A health quality measure encoded in the HQMF format is referred to as an "eMeasure".

## HQMF and Distributed Queries

In the context of Query Health, HQMF is used to represent Distributed Queries which can be used for computing Quality measures, determining disease outbreaks, performing comparative effectiveness analysis, efficacy of drug treatments and monitoring health trends in general. In summary a distributed query is trying to identify populations of interest and ask specific questions of these populations based on organization specific use cases.

## Query Measure Period

The Measure Period for a query designates the reference time frame based on which data is identified, filtered and analyzed. Measure Period for an instantiated query is always designated as a range with a high and a low time value.

## Data Criteria

The Data Criteria of a query identify the various constraints that can be applied on the data to identify populations.

For example:

* “Identify the number of people between the age of 20 – 30 years” narrows the universe of population down to just those who are between 20 and 30 years.
* “Identify people who had a hbA1C test as part of last visit”
* “Identify people with Diabetes type II condition”

Data Criteria can be defined on the following clinical data elements

* Patient Demographics
* Encounters
* Medications
* Lab Results
* Vital Signs
* Problems
* Procedures
* Allergies
* Immunizations

### Filters and Data Criteria

Filters can be applied on Data Criteria to further refine the criteria to identify populations.

For example:

* Identify people who have a hbA1C value > 9% in the most “RECENT” lab test
* Identify the “FIRST” encounter where the patient was diagnosed with Diabetes Type II.

In the above examples “RECENT” and “FIRST” are examples of filters that can be applied to initial data criteria to refine and extract the population of interest.

### Time Relationships and Data Criteria

Data Criteria can be related to other Data Criteria or Measure Period via time relationships.

For example:

* Identify the lab test which occurs one year before the most recent encounter
  + The example relates the encounter with the lab test temporally
* Identify encounters where a particular medication was requested during the Measure Period
  + The example relates encounters where medications was requested to the Measure Period temporally

### Value Sets and Data Criteria

Queries often need to select patients based on enumerated features of demographics, encounters, medications or other criterion that span a range of coded values. These range of coded values are represented as Value Sets and are referenced in HQMF queries to identify the enumerated list of values that need to be used to filter out populations.

A Value Set has a unique identifier that is assigned by the owner of the Value Set. These identifiers are referenced within HQMF which can then be used to access the coded values.

An example of a Value Set is:

* A Value Set for Diabetes Type II from National Quality Forum (NQF) is identified by 2.16.840.1.113883.3.464.0001.37 and contains codes from SNOMED-CT, ICD-9 and ICD-10 vocabularies defining the various types of conditions that get designated as Diabetes.
  + This Value Set includes codes for conditions such as Diabetes Mellitus, Diabetes with ketoacidosis, type II or unspecified type, not stated as uncontrolled etc.

## Population Criteria

The Population Criteria identifies a population using one or more data criteria. Populations can be of multiple types and are used differently in the context of a query. The population types are “Initial Patient Population”, “Denominators”, “Numerators” and “Exclusions”. These different population types provide the information requestors with the required insight to perform analysis within a particular context. The following are definitions of these populations along with some sample examples to illustrate their relationships.

* Initial Patient Population (IPP): IPP can be thought of as the population relevant to the query.
  + For e.g. All patients between the age of 16 and 74.
* Denominator: Denominator can be thought of as a subset of the IPP based on specific criteria.
  + For e.g. All patients between the age of 16 and 74 having the problem of Diabetes Type II
* Numerator: Numerator can be thought of as a subset of the Denominator based on more granular or specific criteria.
  + For e.g. All patients between the age of 16 and 74 having the problem of Diabetes Type II and their most recent lab result has hbA1C value > 9%.
* Exclusions or Exceptions: Exclusions identify a subset of the population that needs to be removed from the the Denominator based on specific criteria.
  + For e.g. The denominator exclusion criteria for the example above can be “All patients between the age of 16 and 74 having the problem of Diabetes Type II but are also designated as having “Steriod Induced Diabetes” or “Gestational” Diabetes.

The relationships between the various population criteria is as shown in Figure 2.1 below

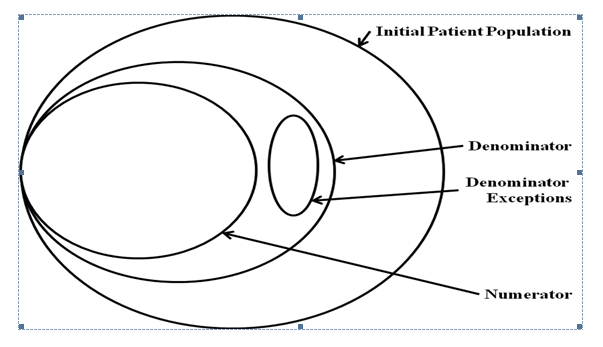


Figure 2.1 – Relationships between Initial Patient Population, Denominator, Numerator and Exceptions

### Population Criteria and Data Criteria

The Population Criteria is constructed using Data Criteria to appropriately identify the right population. In order to use multiple Data Criteria to filter out populations, the Data Criteria are combined logically using “AND/OR/XOR” operators. These operators appear in the form of

* “AllTrue” and “AllFalse”, representing AND operator
* “AtLeastOneTrue” and “AtLeastOneFalse” representing OR operator
* “OnlyOneTrue” and “OnlyOneFalse” representing XOR operator

For example:

* To identify an Initial Patient Population consisting of Male patients between the ages of 16-74 we would construct two Data Criteria elements and combine them as follows:
  + Data Criteria Element 1: “Identify patients between the ages of 16-74”
  + Data Criteria Element 2: “Identify patients who are Male”
  + Combine the above two criteria using the “AllTrue” operator to extract the Initial Patient Population desired.

## Stratifier Criteria

Stratifier Criteria is constructed using Data Criteria and is used to specify how the results need to be grouped.

For example:

* Identify all patients between the ages of 16 – 74 and stratify the counts by Gender and zipcode.

In the above example, the stratification criteria refers to Gender and zipcode to group the counts of patients between 16 and 74.

## Query Health Clinical Element Data Dictionary and HQMF

The QueryHealth Clinical Element Data Dictionary (CEDD) identifies the elements that queries count, sum, average etc. These counts are then used to perform advanced statistical measurements and interpretations. It is essential to understand the basic elements that are expected to be present in the data source that can then be counted, summed, averaged using HQMF queries. The Query Health CEDD identifies these data elements, their definitions and the expected type of data that is present in the data source for each of these data elements. In summary the following are the elements that are being counted by Query Health HQMF queries

* Patients
* Encounters/Visits
* Orders for Interventions or Diagnostic Tests
* Findings
  + History
  + Diagnosis/Problems/Symptoms
  + Measurements (Lab Results, Vital Signs)
* Interventions
  + Medications
  + Immunizations
  + Procedures

For a complete reference of the data elements please refer to the consensus approved Query Health CEDD.

# HQMF Query Structure

The HQMF standard is being adopted by Query Health Initiative to represent distributed queries as discussed earlier. This section explains the different elements that make up a distributed query with examples and provides the HQMF representation of the different elements. The goal of this section is to guide the implementers to create HQMF queries.

The currently balloted version of HQMF DSTU expired in March 2012 and is called as HQMF v3 R1 (Release 1). However as outlined earlier in section 1.2.2 the drawbacks of HQMF prevented Query Health from using HQMF as a standard for distributed queries. To ensure alignment with HQMF and at the same time address the needs of Query Health, the Query Health Technical Work Group identified a number of changes to the existing HQMF to make it more computable and implementer friendly. These changes are discussed in detail in section 5.1.

The rest of this section will discuss how queries are represented in HQMF leveraging the changes to the HQMF and will not be referring to the existing HQMF DSTU unless explicitly mentioned.

The HQMF Query structure is implemented using the HQMF Document structure which has a logical Header portion and a Body portion. While the existing HQMF DSTU has a number of sub-sections, elements and attributes in the logical Header and the Body portions, for the purposes of Query Health the relevant sections are as shown in Figure 3.1 below.

The entire query is present within the <Quality Measure Document> top level element with reference to the HQMF schema (EMeasureNew.xsd) and the namespaces as shown in the listing below:

<QualityMeasureDocument xmlns="urn:hl7-org:v3"

  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
  xsi:schemaLocation="urn:hl7-org:v3

file:/D:/hl7/hqmf/html/domains/uvqm/schemas/EMeasureNew.xsd" >

<!—Document Attributes -->

<!—Author Element Details -->

<!—Custodian Element Details -->

….

</Quality MeasureDocument>

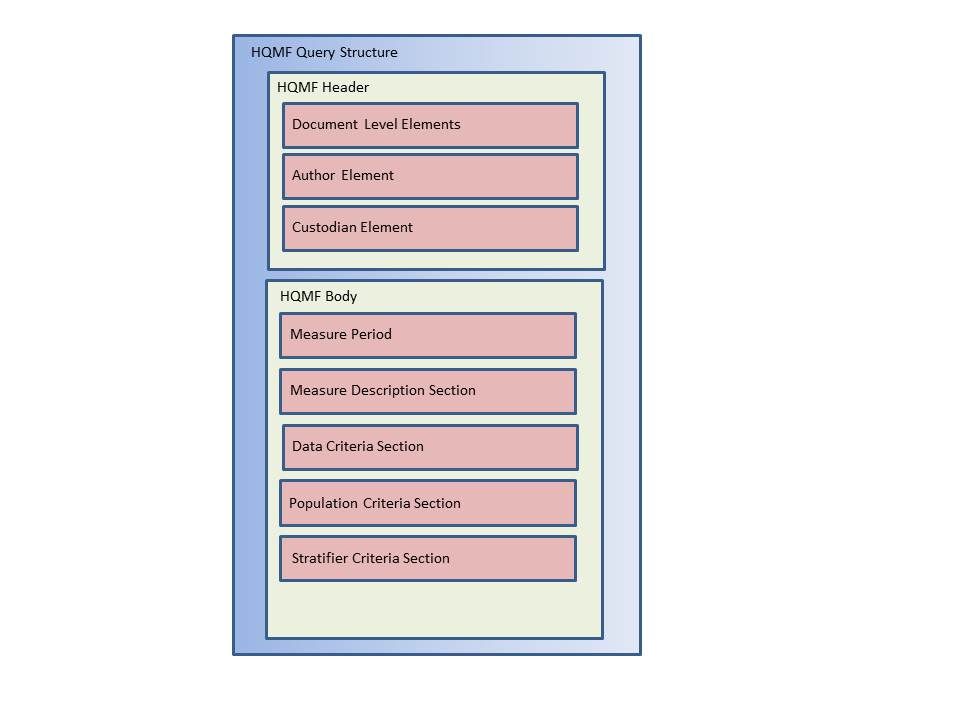


Figure 3.1 – HQMF Structure for Distributed Queries

The next few sub-sections cover details about each of the sub-sections, their elements and attributes for representing queries.

## HQMF Header

The HQMF Header portion contains document level attributes and elements that provide metadata related to the HQMF query.

### Document Level Elements

The document level elements that are relevant to Query Health are

* Title of the query
  + Represents the title or name of the query
* Status of the query
  + Represents if the query is complete
* Version of the query
  + Version of the query
* Document Type
  + Indicates that this of type HQMF using unique code
* Id
  + Represents Globally unique Id for the query.
* SetId
  + A unique id used when implementing quality measures using distributed queries.
* TypeId
  + The Type Id element is used to identify uniquely the HL7 HQMF Specification Reference.
* Author
  + Represents the human or organization that authored the query
* Custodian
  + Represents the organization that is responsible for maintaining the query
* ResultType
  + Represent the type of result expected from the query. The ResultType MUST always be one of the following values for Query Health. {QRDA Category III, QRDA Category II}

These elements are represented in HQMF XML as shown in the listing below

<QualityMeasureDocument ….>

<typeId extension="**POQM\_HD00001**" root="**2.16.840.1.113883.1.3**"/>

<id root="**0**"/>

<code codeSystem="**2.16.840.1.113883.6.1**" code="**57024-2**"/>

<statusCode code="**final**"/>

<setId root="**0**"/>

<versionNumber value="**1**"/>

[<author contextControlCode="**OP**" typeCode="**AUT**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<assignedPerson classCode="**ASSIGNED**"/>

</author>

[<custodian typeCode="**CST**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<assignedPerson classCode="**ASSIGNED**"/>

</custodian>

<resultType code=”**QRDA Category III**”/>

…..

</QualityMeasureDocument>

In the above XML snippet

* The TypeId root refers to the HL7 OID and the extension refers to the HQMF v3 R1 model.
* The Code System “2.16.840.1.113883.6.1” refers to LOINC code system and the value “57024-2” represents HQMF documents uniquely.

#### Author and Custodian

As shown in the above example the Author element has a few attributes which are:

* ContextControlCode whose value is “OP” meaning overriding propagating. This means that all the sections in the document are authored by the assigned person unless it is specified to be different.
* TypeCode of “AUT” represents Author.
* The value of “ASSIGNED” indicates the fact that the person/organization authoring is playing the “ASSIGNED” role on behalf of the scoping organization.

The Custodian element is very similar to the Author element except that the TypeCode is “CST” for Custodian.

The rest of the header elements in the existing HQMF DSTU are optional and will not be used for the purposes of Query Health at this point in time.

#### HQMF Header Conformance Requirements

This section outlines the conformance requirements for the Header portion of the HQMF query.

**CONF 10**: A HQMF Query SHALL contain 1..1 QualityMeasureDocument / typeId / @root valued with "2.16.840.1.113883.1.3".

**CONF 11:** A HQMF Query SHALL contain 1..1 QualityMeasureDocument / typeId / @extension valued with "POQM\_HD000001".

**CONF12:** The value for QualityMeasureDocument/code SHALL be "57024-2" Health Quality Measure Document (CodeSystem: 2.16.840.1.113883.6.1, LOINC)

**CONF13:** The value for QualityMeasureDocument/statusCode SHALL be "final" to indicate that the query is complete and not a draft.

**CONF14:** The value for QualityMeasureDocument/author.contextControlCode SHALL be fixed as "OP".

**CONF15:** The value for QualityMeasureDocument/author.typeCode SHALL be "AUT"

**CONF16:** The value for QualityMeasureDocument/author/assignedPerson.classCode SHALL be "ASSIGNED"

**CONF17:** The value for QualityMeasureDocument/custodian.typeCode SHALL be "CST" .

**CONF18:** The value for QualityMeasureDocument/custodian/assignedPerson.classCode SHALL be "ASSIGNED"

## HQMF Body

The HQMF Body has a number of sub-sections that define the various parts of a distributed query and are above in Figure 3.1. In this section we will examine the details of each of the sub sections and outline the conformance criteria as applicable.

### Measure Parameters

Three parameters impact how a query is evaluated. These are recorded in the <controlVariable> element of the <QualityMeasureDocument> using the <measurePeriod> element. The <value> element of the <measurePeriod> is of the IVL\_TS data type.

* Queries can be created to be instantiated and executed on a target system or
* Queries can be created to be catalogued and added into a library for execution at a later time.

Depending on the purpose of the query, measurePeriod is represented differently.

#### Queries to be catalogued

To define a query that will later be instantiated, only the <width> element need be specified. This defines the default width of the time period over which the query is to be performed. Since the query is being catalogued, the exact execution time is not known and hence only width can be specified.

#### Queries to be executed

For queries which are intended to be executed at a specific time, the <measurePeriod> element must fully specify the time period. The <low> and <high> elements are required, and must contain values which indicate the start and end dates of the measure period respectively. Throughout the query specification the start, end and duration of the measure period are accessible through the variables named MeasurePeriod.low, MeasurePeriod.width and MeasurePeriod.high respectively.

The <controlVariable> element may contain a <localVariableName> element, but it must always contain the value MeasurePeriod if it is present.

#### Rationale for the measurePeriod

The measure time period affects which elements can possibly be accessed during query, and should be available to systems to enable them to optimize for the time period.

#### Examples

The example below shows how an HQMF document would define the measure period for a query that could be executed at some time in the future. The start date and end date for the query are not specified because until the query is executed, the values are not known. The width is supplied for reference, so that a new query can be instantiated from the given definition.

<QualityMeasureDocument>

….

<controlVariable>

<!-- The following element is purely optional, but if included, must appear as shown below -->

<localVariableName>MeasurePeriod</localVariableName>

<measurePeriod><value><width value='1' unit='a'/></value></measurePeriod>

</controlVariable>

….

</QualityMeasureDocument>

The following example shows how the previously mentioned query must be submitted for execution. Note the change in how <measurePeriod> is recorded, using the actual dates appropriate for the query. This is what would actually be sent to perform the query. The creation of the measurePeriod with the right low and high values is performed by the query composer or information requestor.

<QualityMeasureDocument>

…..

<controlVariable>

<measurePeriod>

<value>

<low value=**'20110101'**/>

<high value=**'20111231'**/>

</value>

</measurePeriod>

</controlVariable>

…..

</QualityMeasureDocument>

#### Relationship between Events and Measurement Period

The assumption for all query criteria is that the events being considered are limited to those that occur within the measure period time frame unless otherwise indicated. This time frame is part of the context of the query, and is specified in the measure parameters described above.

#### Rationale

In evaluating a query a system could search for it over all possible events known or limit the evaluation to those events occurring within a particular time frame. For many queries, it is extremely common to limit the query to events within a specific time frame. Using a default time boundary limits the search space and improves the readability of specifications by avoiding unnecessary repetition of the time context. An event can be constrained to occur within a time frame different from the default by specifying that time frame.

#### Measure Parameters Conformance Criteria

For the purposes of Query Health implementations, the following conformance criteria applies.

**CONF 20:** A HQMF Query SHALL contain 1..1 QualityMeasureDocument / controlVariable/measurePeriod element.

**CONF 21:** A HQMF Query SHALL contain valid low and high values as part of the QualityMeasureDocument / controlVariable/measurePeriod element.

### Measure Description Section

The Measure Description Section is an optional section and can be used to describe the query for information purposes. A sample Measure Description Section is as shown in the XML listing below

<QualityMeasureDocument>

...

[<component>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<measureDescriptionSection>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<title> Sample Measure </title>

<text>This is a description of the measure.</text>

</measureDescriptionSection>

</component>

...

</QualityMeasureDocument>

#### Measure Description Section Conformance Criteria

**CONF 30:** A HQMF Query MAY contain 0..1 QualityMeasureDocument / component/measureDescriptionSection elements.

### Data Criteria

The fundamental unit of evaluation for a query is a criteria element. These can be found in <entry> elements appearing in the <DataCriteriaSection> element of a <component> in the <QualityMeasureDocument>. The sample XML is shown below:

<QualityMeasureDocument>

…

<component>

<dataCriteriaSection>

<entry>

<!—Criteria Elements -->

…

</entry>

<dataCriteriaSection>

</component>

…

</QualityMeasureDocument>

In order to simplify the XML listings in this sub-section, XML representation from the <entry> element on down will be used for examples.

Criteria are represented using one of the following XML elements within the entry element.

* <actCriteria>
* <encounterCriteria>
* <observationCriteria>
* <procedureCriteria>
* <substanceAdministrationCriteria> and
* <supplyCriteria>

The different data criteria element names represent different kinds of patient information. Each of the criteria elements contain a number of sub-elements that may be present to filter the selected data elements of interest.

#### Unique Identifiers and Criteria Elements

The data criteria elements are used later in the <populationCriteriaSection> to describe how different sets of information can be combined to select patients meeting the requirements of the query. Therefore, every data criteria element should have an <id> element so that it can be referenced later. A sample XML listing with id element highlighted is as shown below:

[<entry>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

…

[<observationCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**ageBetween17and64**" root="**0**"/>

…

</observationCriteria>

</entry>

#### Criteria Elements and Mapping to Implementation Artifacts

Query Health queries are intended to be executed on data sources with/without human intervention. This requires the queries to be computable and translatable into implementation languages such as SQL, Java Script etc. Each of the implementation platforms represent patient information as tables, objects, files/documents etc. In order to link the declarative criteria to the appropriate information that is present in the data source, a mapping needs to exist between the criteria element and the type of information that the criteria element is trying to filter. This is accomplished using two different elements within the data criteria section.

* Global list of the types of information available.
  + This is represented using the <definition> element within the data criteria section directly. This can be considered global definitions within the data criteria section and can be reused by each of the criteria elements.
* A link from each data criteria element back to the <definition> element identifying the type of information the particular element is trying to filter.

The combination of the two elements allows systems to automatically translate the queries and map them to specific objects and tables within a concrete data source. An example XML listing showing the definitions and the reference from the criteria element back to the definitions is as shown below

<dataCriteriaSection>

[<definition>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<observationDefinition>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**Demographics**" root="**2.16.840.1.113883.3.1619.5148.1**"/>

</observationDefinition>

</definition>

…

[<entry>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

…

[<observationCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**ageBetween22and29**" root="**0**"/>

…

[<definition>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<observationReference moodCode="**DEF**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**Demographics**" root="**0**"/>

</observationReference>

</definition>

</observationCriteria>

</entry>

…

<dataCriteriaSection>

As shown in the example above there is a definition of the type of information being accessed within the dataCriteriaSection. This definition is then referenced via the <observationReference moodCode='DEF'> within the <observationCriteria> element. This reference above allows implementers to map the <observationCriteria> element to the Demographics information objects or tables when executing the query.

The following table identifies the various types of information that can be queried and how they are represented as definitions within the dataCriteriaSection along with a mapping of what criteria elements that reference these definitions.

|  |  |  |
| --- | --- | --- |
| **Type of Information** | **Definition Representation within Data Criteria.** | **Criteria Element that can reference the definition** |
| Demographics | <id root='…' extension='Demographics'/> | ObservationCriteria |
| Problems | <id root='…' extension='Problems'/> | ObservationCriteria |
| Allergies | <id root='…' extension='Allergies'/> | ObservationCriteria |
| Medications | <id root='…' extension='Medications'/> | SubstanceAdministationCriteria  SupplyCriteria[[1]](#footnote-1) |
| Immunizations | <id root='…' extension='Immunizations'/> | SubstanceAdministationCriteria |
| Procedures | <id root='…' extension='Procedures'/> | ProcedureCriteria |
| Encounters | <id root='…' extension='Encounters'/> | EncounterCriteria |
| Diagnostic Results | <id root='…' extension='Results'/> | ObservationCriteria |
| Vital Signs | <id root='…' extension='Vitals'/> | ObservationCriteria |

Table 3.2.3-1 – Data Criteria Section Standard Definitions designating various Information Types

The root attribute is the same for all of these identifiers, and identifies the types of information in the S&I Framework model as it is accessed by Query Health queries. The root attribute is always the OID that will be used for this entry.

#### Local Variables and Criteria Elements

Local variables are a key element within each data criteria elements. These variables are used to help in automatic generation of code and facilitate the naming of variables in the generated code.

The following example shows a <localVariableName>element related to the genderFemale criteria element. The value of the local variable can then be used within generated code as a program variable .

<entry>

<localVariableName>genderFemale</localVariableName>

<observationCriteria>

<id root="0" extension="**genderFemale**"/>

….

</observationCriteria>

</entry>

#### Use of Value Sets within Data Criteria Elements

Each of the data criteria elements can reference a value set which lists the concepts that are part of the value set. The events are filtered out by using the values in this value set such that only events coded to include these values are considered for inclusion in the population criteria elements. The value set is represented using the <code> element of the data criteria and has a unique Id which identifies the value set. The value set can be accessed using a mechanism like IHE SVS profile. An example data criteria element with a value set reference is as shown below.

[<entry>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<localVariableName>AmbulatoryEncounter</localVariableName>

[<encounterCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<id extension="**AmbulatoryEncounter**" root="**0**"/>

<!-- AmbulatoryEncounterValueSet -->

<code valueSet="**2.16.840.1.113883.3.464.1.1142**"/>

…

</encounterCriteria>

</entry>

#### Timing Constraints and Criteria Elements

It is very common to temporally constrain the events of interest to the measurement period in some way. For example, NQF Measure 59 evaluates whether the most recent HbA1C measure taken during the measurement period is greater than 9%. That same measure allows a diagnosis of steroid-induced diabetes to be used as a denominator exception when that diagnosis is found to be active within two years prior to the measurement end date (or one year prior to the measurement start date, since the measure period is one year). There are other cases where a measure may want to evaluate an event that occurs during a specific kind of encounter or procedure.

In order to support these temporal constraints, a criterion must be associated with the event that temporally constrains it, by using the <temporallyRelatedInformation> element.

In the XML representation of these constraints, the outer criterion element (e.g., <observationCriteria>) is usually considered to be the source or constrained criterion, and the inner element is the target, or constraining criterion. These relationships can be reversed by setting the inversionInd attribute to ‘true’ on the <temporallyRelatedInformation> element.

The typeCode attribute of that <temporallyRelatedInformation> element indicates what the temporal constraint is, and must come from the following list of terms in Table 3.2.3.5-1

|  |  |
| --- | --- |
| **Term** | **Outer act temporal relationship to Inner act** |
| EAE | Ends After End |
| EAS | Ends After Start |
| EDU | Ends During |
| EBS | Ends Before Start |
| ECW | Ends Concurrent With |
| SAE | Starts after End |
| SAS | Starts after Starts |
| SDU | Starts During |
| SBS | Starts Before Start |
| SCW | Starts Current With |
| CONCURRENT | Concurrent With |
| DURING | Occurs During |
| OVERLAP | Overlaps With |

Table 3,2,3,5-1 - Timing Constraints in HQMF Query Format

##### Time offsets

To adjust the time being compared by a constant value, the <pauseQuantity> element is used within a <temporallyRelatedInformation> element . The value attribute of this element indicates the magnitude of the change. A positive change adds time to the target element, and negative change subtracts time from the target element. The units of time change comes from the following list of terms, and must be supplied in the unit attribute on the <pauseQuantity> element.

|  |  |
| --- | --- |
| **Term** | **Description** |
| A | Year |
| Mo | Month |
| Wk | Week |
| D | Day |
| H | Hour |
| Min | Minute |
| S | Second |

Table 3.2.3.5-2 - Time Offset Values in HQMF Query Format

The vocabulary defining these terms is precise in its definition of a year. A year is defined as 365.25 days (the mean Julian year), and a month is defined as 1/12th of a year.

An example XML listing showing how an encounter criteria is temporally related to the Measurement Period is shown below:

[<entry>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<localVariableName>EDorInpatientEncounter</localVariableName>

[<encounterCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**EDorInpatientEncounter**" root="**0**"/>

<code valueSet="**2.16.840.1.113883.3.464.1.42**"/>

[<definition>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<observationReference moodCode="**DEF**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**Encounter**" root="**0**"/>

</observationReference>

</definition>

[<temporallyRelatedInformation typeCode="**SAS**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<pauseQuantity value="**-1**" unit="**a**"/>

[<observationReference moodCode="**EVN**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**MeasurementPeriod**" root="**0**"/>

</observationReference>

</temporallyRelatedInformation>

</encounterCriteria>

</entry>

In the above example the “EDorInpatientEncounter” is temporally constrained by the Measurement Period. The outer act in this case is the “EDorInpatientEncounter” and the inner act is “MeasurementPeriod” and the constraint expressed is “Starts After Start” (SAS).The interpretation of the above criteria is as follows:

The encounter’s start time should be after the (MeasurementPeriod’s StartTime – 1 year). So for example if the MeasurementPeriod’s startTime is 20110101, then the encounters that will be considered for this criteria will be only those that started after 20100101. This new time is derived by subtracting the time offset indicated by the <pauseQuantity> element from the target (MeasurementPeriod) time.

#### Ordering Constraints and Criteria Elements (Filtering specific events)

Depending on context, an implementer may want to filter only the smallest or largest value of an observation. Other times they may wish to filter out only the newest or oldest event that has occurred. This is where use of the <subsetCode> along with the <excerpt> element within a data criteria element can assist in filtering the events.

The <excerpt> element allows you to specify which of the events the implementer wants, ordered or summarized either by time of the event, or by its value (in the case of an observation). The subset of information desired is recorded in the <subsetCode> element of the <excerpt> element.

The complete listing of subset codes are defined in the table below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Term** | **Description** | **Ordered By** | **Comments** |
| PAST | Previous | Date Ascending | Selects all events that occurred or were expected to occur in the past. |
| FIRST | First Known | Date Ascending | Selects the first known event that occurred or was expected to occur in the past. |
| RECENT | Most Recent | Date Descending | Selects the most recent event that occurred or was expected to occur in the past. |
| FUTURE | Expected Future | Date Ascending | Selects all events that are expected to occur in the future. |
| LAST | Expected Last | Date Descending | Selects the very last event that is expected or scheduled to occur in the future. |
| NEXT | Expected Next | Date Ascending | Selects the next event that is expected or scheduled to occur in the future. |
| SUMMARY | Summary | Summaries report the average value, and total number of occurrences for all occurrences, future occurrences, and past occurrences for SUMMARY, FUTSUM, and PREVSUM respectively. | Composes a summary of all events that have ever occurred, or were scheduled to occur at any time. |
| FUTSUM | Future Summary | Composes a summary of all events that are expected or scheduled to occur at any time in the future. |
| PREVSUM | Previous Summary | Composes a summary of all events that have ever occurred, or were scheduled to occur in the past. |
| MAX | Maximum | Value Ascending | The observation with the largest value. |
| MIN | Minimum | Value Descending | The observation with the smallest value. |

Table .2.3.6-1 - Allowed Subset codes in HQMF Query Format

##### Selecting the Nth in Order

The <sequenceNumber> element may be constrained to select the Nth item in order by value (using MIN or MAX) or by date (using PAST, FIRST, RECENT, LAST or NEXT). If for example, you are interested in the second highest value of an observation, you would set the value attribute of <sequenceNumber> to 2 inside the <entry> or act relationship, and specify MAX as the subsetCode. If instead you were interested in the second occurrence of a past event, you would still set <sequenceNumber> to 2, but use the subsetCode of PAST.

The following are some examples which show the use of <excerpt> element along with the subset code.

[<entry>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<localVariableName>HbA1Cgt9</localVariableName>

[<observationCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<id extension="**HbA1C**" root="**0**"/>

<code valueSet="**2.16.840.1.113883.3.464.1.72**"/>

[<definition>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<observationReference moodCode="**DEF**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**LabResults**" root="**0**"/>

</observationReference>

</definition>

[<excerpt>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<subsetCode code="**RECENT**"/>

[<observationCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**0**" root="**HbA1CMeasured**"/>

[<value xsi:type="**IVL\_PQ**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<low value="**9**" unit="**%**"/></value>

</observationCriteria>

</excerpt>

</observationCriteria>

</entry>

Listing .2.3.6-2 – Example showing subset and excerpt elements

In the above example, the subset code of “RECENT” is used to filter out the “MOST RECENT” lab test based on the value set “2.16.840.1.113883.3.464.1.72” and occurringwithin the Measurement Period. Then the lab test is checked to see if there was a hbA1C value > 9% that was recorded in that test.

[<entry>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<localVariableName>AmbulatoryEncounter</localVariableName>

[<encounterCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<id extension="**AmbulatoryEncounter**" root="**0**"/>

<!-- AmbulatoryEncounterValueSet -->

<code valueSet="2.16.840.1.113883.3.464.1.1142"/>

[<definition>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<observationReference moodCode="DEF">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<id extension="Encounter" root="0"/></observationReference>

</definition>

[<excerpt>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<subsetCode code="PREVSUM"/>

[<encounterCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<repeatNumber>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<low value="2" inclusive="true"/></repeatNumber>

</encounterCriteria>

</excerpt>

[<temporallyRelatedInformation typeCode="EAS">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<pauseQuantity value="-1" unit="a"/>

[<observationReference>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="MeasurePeriod" root="0"/>

</observationReference>

</temporallyRelatedInformation>

</encounterCriteria>

</entry>

Listing 3.2.3.6-3 – Example showing excerpt, subset elements

In the above example, the <excerpt> element is used to sum the number of past occurances. The <repeatNumber> element indicates the number that we are looking for which is at least 2 occurances in the past of “Ambulatory Encounters”. The occurrences have to be in the past based on the time reference which is indicated by the <temporallyRelatedInformation> which says that the Encounter’s End Time is after the Start Time (EAS) of the time reference. The Time Reference itself is based on the Measurement Period and the Start Time reference value is MeasurementPeriod Start Time – 1 year and the End time reference value is the Measurement Period End Time.

#### HQMF Data Criteria Conformance Requirements

**CONF 40:** Each data criteria element within a HQMF Query SHALL contain 1..1 <id> element which is unique within the query.

**CONF 41:** The data criteria section within a HQMF Query SHALL contain each of the definitions identified in Table 3.2.3-1 above.

**CONF 42:** Each data criteria element within a HQMF Query SHALL contain 1..1 <localVariableName> element.

**CONF 43:** Every HQMF Query SHALL contain 1..\* concrete data criteria elements.

**CONF 44:** Temporal constraints within data criteria elements SHALL be expressed using the values from the table 3.2.3.5-1

**CONF 45:** Ordering constraints within data criteria elements SHALL be expressed using the subset codes from the table 3.2.3.6-1

In the following sub-sections we will examine specific data criteria elements that are part of the HQMF queries.

#### Demographics Criteria

There are several possible ways to represent demographics of the patient in HQMF. Most demographics can be represented using coded values on the patient participation, but in order to query by geographic criteria, these values would not be able to be constrained to a specific value set. Thus, one could ask for patients in a single postal code, city, or state, but could not ask for patients living in a wider geographic region made up of several states or postal codes. Also, it is not possible to ask for patients within a specific age group, or range of birth or death dates because these are limited to the timestamp (TS) data type.

To address these issues, demographics are queried upon using the <observationCriteria> element, which represents the criteria as observations about the patient. The demographic being queried is identified in the <code> element of the <observationCriteria> element.

The particular value of that demographic data item is constrained in the <value> element of the <observationCriteria> element.

The use of <observationCriteria> for demographics allows query developers to specify patient attributes as ranges, value sets, or discrete values. The following table identifies the coded values and data types for the value elements to be used within observationCriteria element for Demographics.

|  |  |  |  |
| --- | --- | --- | --- |
| **Concept** | **SNOMED CT Code for coded value** | **Preferred Name** | **Data Type for Value elements** |
| Age | 424144002 | Current Chronological Age | IVL\_PQ |
| Birth Date | 184099003 | Date of Birth | IVL\_TS |
| Date of Death | 399753006 | Date of Death | IVL\_TS |
| Gender | 263495000 | Gender | CE or ST |
| Race | 103579009 | Race | CE or ST |
| Ethnicity | 364699009 | Ethnic Group | CE or ST |
| Marital Status | 125680007 | Marital Status | CE or ST |
| Religious Preference | 160538000 | Religious Affiliation | CE or ST |
| Birth Place | 169812000 | Place of Birth | ADDR |
| Address | 184097001 | Patient Address | ADDR |
| Postal Code | 184102003 | Patient Postal Code | CE or ST |
| City | 433178008 | City of Residence | CE or ST |
| State | N/A | State/Province of Residence | CE or ST |
| Country | 416647007 | Country of Residence | CE or ST |
| County | 432407003 | County of Residence | CE or ST |
| Street Address | 398099009 | Street Address | ST |

Table 3.2.3.8-1 - Demographics Codes and Data Types for HQMF Query Format

##### Representing Age in Demographics

The chronological age of the patient varies over time and depends upon the time context. When age is evaluated independently from any other event, it is assumed to be age at any time during the period being queried against. The unit attribute should be reported using terms from the table below, using years, months, weeks, days or hours as appropriate.

|  |  |
| --- | --- |
| **Term** | **Description** |
| a | Year |
| mo | Month |
| wk | Week |
| d | Day |
| h | Hour |

Table 3.2.3.8-2 – Units to Represent Age in a Query

##### Demographic Criteria Examples

The following is an example of Demographics criteria looking for patients between the ages of 17 and 64.

<observationCriteria>

<id root='…' />

<code code=**'424144002'** displayName=**'Age'**   
 codeSystem=**'2.16.840.1.113883.6.96'** codeSystemName='SNOMED-CT'/>

<value xsi:type='IVL\_PQ'>

<low value=**'17'** unit=**'a'**/>

<high value=**'64'** unit=**'a'**/>

</value>

…

</observationCriteria>

The following is another example of Demographics criteria querying for a particular gender.

<observationCriteria>

<id root="0" extension="**genderMale**"/>

<code code="**263495000**" codeSystem="**2.16.840.1.113883.6.96**"

displayName="**Gender**"/>

<value xsi:type="CD" codeSystem="2.16.840.1.113883.1.11.1"

code="M**"/>**

<definition>

<observationReference moodCode="**DEF**">

<id root="0" extension="**Demographics**"/>

</observationReference>

</definition>

</observationCriteria>

##### Demographic Criteria Conformance Requirements

**CONF 50:** For HQMF queries specifying demographics criteria the coded values within the observationCriteria element SHALL be according to the table 3.2.3.8-1

**CONF 51:** For HQMF queries specifying demographics criteria the the data types for the value element within the observationCriteria element SHALL be according to the table 3.2.3.8-1

**CONF 52:** Demographic criteria within HQMF queries SHALL be represented as observationCriteria element.

#### Problems Criteria

The <observationCriteria> element is used to record criteria based on a patient’s problems. The <value> element of the <observationCriteria> must be a coded concept that identifies the problem of interest.

##### Problem Examples

The following example shows how an HQMF query format can be used to check who within a population has diabetes. A Concept Descriptor (CD) data type is used to capture a specific value from a value set, that is used to describe the specific problem or set of problems.

<entry>  
        <localVariableName>**HasDiabetes**</localVariableName>  
        <observationCriteria>  
          <id root="0" extension="**HasDiabetes**"/>  
          <statusCode code="**completed**"/>  
          <value xsi:type="CD" valueSet="**2.16.840.1.113883.3.464.1.37**"/>  
          <definition>  
            <observationReference moodCode="**DEF**">  
              <id root="0" extension="**Problem**"/>  
            </observationReference>  
          </definition>  
        </observationCriteria>

</entry>

##### Problem Criteria Conformance Requirements

**CONF 60:** Problem criteria within HQMF queries SHALL be represented using observationCriteria element.

**CONF 61:** The Value Set for problem criteria SHALL be specified in the value element using a data type of CD.

**CONF 62:** The problem status SHALL be specified in the statusCode element.

#### Lab Results

The <observationCriteria> element is used to specify criteria based on a patient’s lab results. The value set for the types of lab tests is represented using the value set attribute of the code element.

##### Results Examples

The following example shows how an HQMF query format can be used to check for a lab test result for hbA1C > 9%.

[<entry>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<localVariableName>HbA1Cgt9</localVariableName>

[<observationCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<id extension="**HbA1C**" root="**0**"/>

<code valueSet="**2.16.840.1.113883.3.464.1.72**"/>

[<definition>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

[<observationReference moodCode="**DEF**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**LabResults**" root="**0**"/>

</observationReference>

</definition>

[<excerpt>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<subsetCode code="**RECENT**"/>

[<observationCriteria>](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)

<id extension="**0**" root="**HbA1CMeasured**"/>

[<value xsi:type="**IVL\_PQ**">](file:///C:\Harris%20Official\Healthcare\NHIN\NHIN%20ARM\Projects\Distributed%20Queries\Technical%20WG\Reference%20Implementation\HQMF\archive\archive\standards\hqmf\samples\NQF59New.xml)<low value="**9**" unit="**%**"/></value>

</observationCriteria>

</excerpt>

</observationCriteria>

</entry>

##### Result Criteria Conformance Requirements

**CONF 70:** Result criteria within HQMF queries SHALL be represented using observationCriteria element.

**CONF 71:** The Value Set for the lab tests SHALL be specified as part of the code element.

**CONF 72:** The physical values measured during lab tests SHALL be specified as part of the value element using a data type of IVL\_PQ.

#### Encounters

To represent an encounter within a query, the encounter entry must be represented using the <encounterCriteria> element. The actual encounter being queried for is captured in the <code> element.

##### Encounter Examples

The following example shows how an Emergency Department and/or Inpatient Encounter can be defined within an HQMF entry.

<entry>  
        <localVariableName>**EDorInpatientEncounter**</localVariableName>  
        <encounterCriteria>  
          <id root="0" extension="**EDorInpatientEncounter**"/>  
          <code valueSet="**2.16.840.1.113883.3.464.1.42**"/>  
          <!-- EDorInpatientEncounterValueSet -->  
          <definition>  
            <observationReference moodCode="DEF">  
              <id root="0" extension="**Encounter**"/>  
            </observationReference>  
          </definition>  
          <temporallyRelatedInformation typeCode="**SAS**">  
            <pauseQuantity value="**-1**" unit="**a**"/>  
            <observationReference moodCode="**EVN**">  
              <id root="0" extension="MeasurementPeriod"/>  
            </observationReference>  
          </temporallyRelatedInformation>  
        </encounterCriteria>  
</entry>

##### Encounter Criteria Conformance Requirements

**CONF 80:** Encounter criteria within HQMF queries SHALL be represented using encounterCritera element.

**CONF 81:** The Value Set for encounterCriteria SHALL be specified within the code element.

#### Medications

The <substanceAdministrationCriteria> element is used to query for a specific medication that is administered or intended. For Medication ordered or supplied, <supplyCriteria> element is used.

##### Medication Examples

The following example shows how the HQMF query format can be used to query for the diabetes medications that have been prescribed to a specific population.

<entry>  
        <localVariableName>**DiabetesMedIntended**</localVariableName>  
        <substanceAdministrationCriteria moodCode="**INT**">  
          <id root="0" extension="**DiabetesMedIntended**"/>  
          <participant typeCode="**CSM**">  
            <roleParticipant classCode="**THER**">  
              <code valueSet="**2.16.840.1.113883.3.464.1.94**"/>  
            </roleParticipant>  
          </participant>  
          <definition>  
            <substanceAdministrationReference moodCode="**DEF**">  
              <id root="0" extension="**Medication**"/>  
            </substanceAdministrationReference>  
          </definition>  
          <temporallyRelatedInformation typeCode="**SAS**">  
            <pauseQuantity value="-**1**" unit="**a**"/>  
            <observationReference>  
              <id root="0" extension="**MeasurePeriod**"/>  
            </observationReference>              
          </temporallyRelatedInformation>  
        </substanceAdministrationCriteria>  
 </entry>

##### Medication Criteria Conformance Requirements

**CONF 90:** Medication criteria related to administered medications and medications intended within HQMF queries SHALL be represented using substanceAdministrationCriteria element.

**CONF 91:** The Value Set for Medication Criteria identifying the medication SHALL be specified within the code element of the participant.

#### Orders

The <supplyCriteria> element is used to query for a specific order. The <supplyCriteria> element is designed to capture specific information about an order that can also be linked to Medication entries.

##### Order Examples

The following example shows how an order for diabetes medications can be queried.

<entry>  
        <localVariableName>**DiabetesMedOrdered**</localVariableName>  
        <supplyCriteria moodCode="**RQO**">  
          <id root="0" extension="**DiabetesMedOrdered**"/>  
          <participant typeCode="**PRD**">  
            <roleParticipant classCode="**THER**">  
              <code valueSet="**2.16.840.1.113883.3.464.1.94**"/>  
            </roleParticipant>  
          </participant>  
          <definition>  
            <supplyReference moodCode="**DEF**">  
              <id root="0" extension="**RX**"/>  
            </supplyReference>  
          </definition>  
          <temporallyRelatedInformation typeCode="**SAS**">  
            <pauseQuantity value="-**1**" unit="**a**"/>  
            <observationReference>  
              <id root="0" extension="**MeasurePeriod**"/>  
            </observationReference>              
          </temporallyRelatedInformation>  
        </supplyCriteria>  
</entry>

##### Order Criteria Conformance Requirements

**CONF 95:** Order criteria related to administered medications and medications intended within HQMF queries SHALL be represented using supplyCriteria element.

**CONF 96:** The Value Set for Medication Criteria identifying the medication SHALL be specified within the code element of the participant.

### Population Criteria

The Population Criteria section contains criteria for the measure populations of interest for the query. The following are the different types of measure populations currently supported by HQMF queries

* Initial Patient Population
* Numerator
* Denominator
* Denominator Exclusions or Exceptions
* Numerator Exclusions or Exceptions
* Stratifiers

The relationship between these different populations are explained in HQMF FoundationsKey Concepts For Query Health.

All population criteria elements reference other data criteria elements which identify specific patients to be included or excluded as part of the populations. In addition to these the population criteria elements have a precondition element to identify how the data criteria must be combined logically (AND/OR/XOR) and allow for nested recursion. The various preconditions that are supported are

* AllTrue
* AllFalse
* AtLeastOneTrue
* AtLeastOneFalse
* OnlyOneTrue
* OnlyOneFalse.

##### Initial Patient Population

The <patientPopulationCriteria> element is used to define the initial population criteria for the specific query. The patient population criteria element references other data criteria to specify who needs to be included in the population. The logical operation by default for Initial Patient Population is “AND” unless explicitly specified using precondition.

The following example shows a generic example of how patient population criteria can be applied to constrain a query to individuals between the ages of 17 and 64.

<entry>  
        <patientPopulationCriteria>  
          <id root="c75181d0-73eb-11de-8a39-0800200c9a66"  
            extension="**IPP**"/>  
          <precondition>  
            <observationReference>  
              <id root="0" extension="**ageBetween17and64**"/>  
            </observationReference>  
          </precondition>  
        </patientPopulationCriteria>

</entry>

##### Numerator

The Numerator population is represented using the <numeratorCriteria> element. The numerator element references other data criteria to specify who needs to be included in the population.

The following example shows how a numerator is developed surrounding HbAc1. The logical operation by default for Numerator is “AND” unless explicitly specified using precondition.

<numeratorCriteria>  
          <id root="c75181d0-73eb-11de-8a39-0800200c9a66"  
            extension="**NUMER**"/>  
          <precondition>  
            <observationReference>  
              <id root="0" extension="**HbA1Cgt9**"/>  
            </observationReference>  
          </precondition>  
</numeratorCriteria>

##### Denominator

The Denominator population is represented using the <denominatorCriteria> element. The denominator element references other data criteria to specify who needs to be included in the population.

The following is an example of Denominator criteria based on NQF0059 quality measure. The logical operation by default for Denominator is “AND” unless explicitly specified using precondition.

  <entry>  
        <denominatorCriteria>  
          <id root="c75181d0-73eb-11de-8a39-0800200c9a66"  
            extension="**DENOM**"/>  
          <precondition>  
            <**atLeastOneTrue**>  
              <precondition>  
                <**allTrue**>  
                  <precondition>  
                    <observationReference>  
                      <id root="0" extension="**HasDiabetes**"/>  
                    </observationReference>  
                  </precondition>  
                  <precondition>  
                    <**atLeastOneTrue**>  
                      <precondition>  
                        <encounterReference>  
                          <id root="0"  
                            extension="**EDorInpatientEncounter**"/>  
                        </encounterReference>  
                      </precondition>  
                      <precondition>  
                        <encounterReference>  
                          <id root="0" extension="**AmbulatoryEncounter**"/>  
                        </encounterReference>  
                      </precondition>  
                    </**atLeastOneTrue**>  
                  </precondition>  
                </**allTrue**>  
              </precondition>  
              <precondition>  
                <substanceAdministrationReference>  
                  <id root="0" extension="**DiabetesMedAdministered**"/>  
                </substanceAdministrationReference>  
              </precondition>  
              <precondition>  
                <substanceAdministrationReference moodCode="**INT**">  
                  <id root="0" extension="**DiabetesMedIntended**"/>  
                </substanceAdministrationReference>  
              </precondition>  
              <precondition>  
                <supplyReference>  
                  <id root="0" extension="**DiabetesMedSupplied**"/>  
                </supplyReference>  
              </precondition>  
              <precondition>  
                <supplyReference moodCode="**RQO**">  
                  <id root="0" extension="**DiabetesMedOrdered**"/>  
                </supplyReference>  
              </precondition>  
            </**atLeastOneTrue**>  
          </precondition>  
        </denominatorCriteria>  
      </entry>

##### Denominator Exceptions or Exclusions.

The <denominatorExceptionCriteria> can be used to define specific exceptions that need to be accomodated into the denominator. The denominator element references other data criteria to specify who needs to be excluded from the denominator. The logical operation by default for Denominator Exceptions is “OR” unless explicitly specified using precondition.

The following example specific denominator exceptions being defined for a diabetes query based on NQF0059.

<entry>  
        <denominatorExceptionCriteria>  
          <id root="c75181d0-73eb-11de-8a39-0800200c9a66"  
            extension="**DENEXCEP**"/>  
          <precondition>  
            **<allTrue>  
*<***precondition***>*** <observationReference>  
                  <id root="0" extension="**HasPolycysticOvaries**"/>  
                </observationReference>  
              </precondition>  
              <precondition>  
                <observationReference>  
                  <id root="0" extension="**HasDiabetes**"/>  
                </observationReference>  
              </precondition>  
            </**allTrue**>  
          </precondition>  
          <precondition>  
            <observationReference>  
              <id root="0" extension="**HasSteroidInducedDiabetes**"/>  
            </observationReference>  
          </precondition>  
          <precondition>  
            <observationReference>  
              <id root="0" extension="**HasGestationalDiabetes**"/>  
            </observationReference>  
          </precondition>  
        </denominatorExceptionCriteria>  
</entry>

##### Defining Stratification

The <stratifierCriteria> element can be used to help in creating stratification scores. Stratifiers add groupings that can be used to segment outputs using additional criteria. For each stratifier sub-element which references a data criteria all of the different population measures requested in the query should be output.

In the following example, a <stratifierCriteria> element is defined to stratify by both male and female gender.

In this example, the Initial Patient Population, Numerator, Denominator and Denominator exceptions should be reported and grouped by Males and Females.

<entry>  
        <localVariableName>**Gender**</localVariableName>  
        <stratifierCriteria>  
          <id root="c75181d0-73eb-11de-8a39-0800200c9a66"  
            extension="**CLASSIFIER2**"/>  
          <precondition>  
            <observationReference>  
              <id root="0" extension="**genderMale**"/>  
            </observationReference>  
          </precondition>  
          <precondition>  
            <observationReference>  
              <id root="0" extension="**genderFemale**"/>  
            </observationReference>  
          </precondition>  
      </stratifierCriteria>

</entry>

#### Population Criteria Conformance Requirements

**CONF 100:** Each HQMF query SHALL contain 1..\* Population Criteria element.

**CONF 101:** Each HQMF query SHALL use the <patientPopulationCriteria> element to designate Initial Patient Population.

**CONF 102:** Each HQMF query SHALL use the <numeratorCriteria> element to designate Numerator population.

**CONF 103:** Each HQMF query SHALL use the <denominatorCriteria> element to designate Denominator population

**CONF 104:** Each HQMF query SHALL use the <denominatorExceptionCriteria> element to designate Denominator Exceptions.

**CONF 105:** Each HQMF query SHALL use <stratifierCriteria> element to designate stratifiers required for the query.

**CONF 106:** Population Criteria elements SHALL reference data criteria elements from data criteria section.

# Putting It Together – Working HQMF Queries

The following is an example of NQF0059 measure represented using all of the above concepts discussed in the document so far.

<http://code.google.com/p/query-health/source/browse/#hg%2FStandards%2Fhqmf%2Fsamples>

# Appendix A - HQMF Enhancement Status – March 2012

This list of proposed enhancements/issues document specific changes the S&I Framework Query Health Initiative is proposing for the Health Level 7 (HL7) Structured Document Working Group (SDWG) surrounding continued development of the Health Quality Measure Format (HQMF) standard.

The S&I Framework has documented these enhancements within this implementation guidance and will work in coordination with multiple stakeholders who may have an interest in improving the HQMF standard. This includes stakeholders from the National Quality Forum (NQF), Centers for Medicaid and Medicare Services (CMS), the MITRE Corporation, and the Query Health community. A series of key themes underline this proposed set of enhancements:

* **We are looking to enhance and simplify the current HQMF schema to support the needs of the S&I Framework Query Health initiative. We will work with current stakeholders and implementers involved with the HQMF standard to further detail and explain these suggested proposed enhancements.**
* **The S&I Framework is willing to offer a to-be-determined level of support and resources to support the development of these enhancements and to facilitate discussions and coordination efforts that may be necessary to ensure these enhancements are adopted by HL7.**
* **Enhancements are intended to be complimentary – they should not interfere and should have minimal to no overlap with other proposed changes by HQMF implementers or users. We would actively seek to coordinate this set of enhancements with other stakeholders to ensure the proposed enhancements serve the broadest audience of potential HQMF implementers.**
* **We are extremely appreciative of current volunteer efforts in proposing these enhancements; we want to leverage efforts and analysis already done by the community as much as possible and not invent new work.**
* **We wish to work with members of the Structured Documents Working Group (SDWG) to amend and improve upon this list of enhancements.**

The attached tables/appendices outline the current status of proposed enhancements to the HQMF standard, as of April 2012. Please note that this ties directly to the HQMF Project Scope Statement, which has been submitted with this appendix to the HL7 Structured Documents Working Group (SDWG).

## Proposed HQMF Enhancements – Status as of April 2012

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Requested Enhancement/Problem** | **Further Detail** | **Current Resolution** | **Additional Work Required** | **Owner** |
| Analyze possible methods of making HQMF schema more executable – current declarative syntax is not easily executable | Analysis would be conducted | Analysis is ongoing to ensure the updated HQMF schema works properly | Additional feedback from real world pilots will inform other changes required. | Marc Hadley |
| “Greening” process would significantly enhance the HQMF schema for readability and represents a longer-term proposed enhancement | It is estimated that a “green” representation of the HQMF schema could produce the following benefits:   * 65% File Size, * 55% Line Count reductions in XML | greenCDA work on HQMF has been postponed at this time. However a new intermediate model for translating HQMF to procedural languages like SQL/Java Script has been created which can start as a starting point. | No work will be performed until 2013 | Keith Boone |
| Need for example snippets of XML in the HQMF implementation guide to support implementers | General examples need to be included in implementation guidance from both Query Health and as part of the HQMF standard | Example snippets are provided in both the HQMF.NEXT implementation guidance and in Query Catalogs developed for implementers | Ready for testing and piloting | All |
| Ratio and Continuous Variable computation specified in plain text | Define further in coordination with SDWG and Mitre, but would focus on alternative representations for these computations | Work is ongoing to support this enhancement. | Currently not required for pilots and will be explored as part of the pilots. | Marc Hadley |
| Add entry/localVariableName to HQMF Schema | Necessary to support meaningful names in translations of HQMF to executable code. | Explained within the IG. | Ready for testing and piloting | Keith Boone |
| Add entry/subsetCode to HQMF Schema | Necessary to support criteria based on min, max, median, count or average. | Explained within IG | Ready for testing and piloting | Keith Boone |
| Add a representation for value/expression to HQMF Schema | Needed to support representation of computable expressions. | Propose using Java Script.  http://wiki.siframework.org/JavaScript+Execution+Environments | Pilot feedback on using Javascript will be incorporated. | Keith Boone |
| Control Variables not represented properly | Certain measure parameters (duration, start date, end date) should be Control Variables, not using the subject relationship. | Removed subjectRelationship and replaced with control variable element | Ready for testing and piloting | Keith Boone |
| Add variables within a measure | This would allow complex elements to be defined once and referenced throughout a measure’s criteria | Local and control variables now defined within Sections 2.1.1 and 2.1.2 of this implementation guidance | Ready for testing and piloting |  |
| Expression of valueSet criteria in HQMF Schema: as a valueSet attribute | OID is typed in schema, has clear semantics, matches QBE expectation | Completed – no new datatype has been created for several code systems as part of this iteration of the schema | Ready for testing and piloting | Keith Boone |
| Expression of valueSet criteria in HQMF Schema: expression of a code in a code system | No validation support, unclear semantics that overlap with “match this code” | Section 2.1.3 documents the approach within the modified HQMF schema for how to express and reference value sets | Ready for testing and piloting | Keith Boone |
| NQF value set identifiers are not represented as valid Object Identifiers (OIDs) | NQF value set identifiers ARE NEARLY valid OIDS, but not quite. They must remove leading zeros to be valid | Currently using NQF Value Set OID’s provided | This work will be coordinated with NQF.  The value set OID changes may not occur until sometime in 2012. | NQF  SDWG |
| General use of business names in HQMF  HQMF uses section, entry, and sourceOf in many places. The semantics of these are expressed in code, @typeCode, et cetera, in the XML.  This makes the XML difficult for readers to understand. | General improvements through the use of business names in the HQMF schema are proposed. Estimated improvements include:   * 30% reduction in file size, * 10% Line Count reductions in XML | Business Names defined in the entire HQMF schema | Ready for testing and piloting | SDWG |
| Use HQMF Schema Section proposed business names:   * MeasureDescriptionSection * DataCriteriaSection * PopulationCriteriaSection * MeasureObservationSection | General improvements to schema through use of business names - similar to approach adopted for CDA Consolidation | Each business name is now implemented in the updated HQMF schema | Ready for testing and piloting | Keith Boone |
| Use HQMF Named Criteria proposed business names:   * <PopulationCriteria> * <NumeratorCriteria> * <DenominatorCriteria> * <DenominatorExceptionCriteria> * <ClassifierCriteria> * <MeasureCriteria> | General improvements to schema through use of business names - similar to approach adopted for CDA Consolidation | Each business name is now implemented in the updated HQMF schema | Ready for testing and piloting | Keith Boone |
| Use HQMF Criterion Acts proposed business names   * **<**actCriteria> * <observationCriteria> * <supplyCriteria> * <substanceAdministrationCriteria> * <procedureCriteria> * <encounterCriteria> | General improvements to schema through use of business names - similar to approach adopted for CDA Consolidation | Each business name is now implemented in the updated HQMF schema | Ready for testing and piloting | Keith Boone |
| Use HQMF Criterion References proposed business names   * <actCriterionRef> * <observationCriterionRef> * <supplyCriterionRef> * <substanceAdministrationCriterionRef> * <procedureCriterionRef> * <encounterCriterionRef> * <actDefinitionRef> * <observationDefinitionRef> * <supplyDefinitionRef> * <substanceDefinitionCriterionRef> * <procedureDefinitionRef> * <encounterDefinitionRef> | General improvements to schema through use of business names - similar to approach adopted for CDA Consolidation | Each business name is now implemented in the updated HQMF schema | Ready for testing and piloting | Keith Boone |
| Model specific ActRelationships within the HQMF schema:   * <component> * <precondition> * <temporallyRelated> (including time and range indicators) * <references> * <hasOutcome> * <hasReason> * <hasSubject> * <instantiates> * <sourceOf> | Given the frequency in which certain relationships are used, these relationships would be better served as being modeled for reuse. | Each of the actRelationships for precondition and temporallyRelated and references have now been explicitly modeled within the HQMF schema. The others hasOutcome, hasReason, hasSubject, instantiates are not required for pilots at this time. | Ready for testing and piloting | Keith Boone |
| Use of business names for Pre-condition Conjunctions in the HQMF Schema |  | This has now been added as a <precondition> element | Ready for testing and piloting | Keith Boone |
| Addition of classifier semantics to support measure (query) results that need to be broken down by population subgroups | Classifiers add groupings that can be used to segment outputs using additional criteria | This has now been added as a <stratifierCriteria> element | Ready for testing and piloting | Keith Boone |
| Two representations of patient demographics are possible:   1. Observations on patient 2. Attributes of subject participant in criteria   Creates implementation challenge | Former readily mapped from SNOMED CT/LOINC to subject attributes. RIM Models do not support Query By Example (criterionInd) on subjects.  For example, you cannot represent subjects with Date of Birth in a specified range in the RIM | Demographics are represented as observations on patients. | Ready for testing and piloting | Keith Boone |
| Multiple ways to compute age/birth   1. Assume a pre-computed age observation (Useful but incomplete) 2. Represent **birth** events as an observation (Accurate but confusing), and use TemporallyPertains and pauseQuantity 3. Represent **date of birth** as an observation (Less accurate but more understandable) , and use TemporallyPertains and pauseQuantity 4. Represent age-related criteria as DOB-related criteria (awkward). 5. Some combination of 1 and 2 or 3 | This level of optionality can create implementation challenges as no one method is required and each method has specific issues in how it is implemented | Proposed a single method of computing age as part of demographics criteria | Ready for testing and piloting | Keith Boone |
| Time Dependencies can be represented in two ways:   1. Using expressions in effectiveTime, activityTime or other time attributes (simpler XML, but requires parsing of expressions) 2. Using pauseQuantity and temporallyPertains vocabulary in act relationships.   The temporallyPertains vocabulary currently doesn’t work to capture time dependencies.  It appears that the vocabulary is incomplete (at least one atomic condition cannot be represented), and inconsistent (there is no clear rule for what terms were deemed important for inclusion) | The ambiguity in representation of time ranges and specific time can cause implementation issues as it is difficult to show dependencies on time within a measure | Timing constraints section now supports how to represent time dependencies within a query using temporally Related element. | Ready for testing and piloting | Keith Boone |
| Model relationships - Two current methods being used:   1. As an instance of a definition. Easily related to a standard definition that can be reused. 2. As component of something, often identified using CCD Section codes. Can complicate criteria unnecessarily unless inverted.   Creates implementation challenge as some implementers may choose to use method #2 | The specific issue surrounds possible use of method #2, which can be complicated to model and implement. | Method #1 is being used as part of the new HQMF. | Ready for Pilots and Testing. | Keith Boone |
| Distinction between data criteria and data elements is not clear.  Data Criteria is fully specified query that identifies items of interest. Data elements simply tell you what data will be used to determine if a record matches the criteria.  The difference between a criteria and an element is not clearly specified in HQMF and creates an implementation challenge for implementers who do not understand the distinction | For example, for NQF 059 measure, an implementer may not interested in all patients with an HbA1C value (a data element), just those with an HbA1C value > 9% (data criteria). Measure developers will require both, as moving forward measures are more likely to ask for actual values and encourage computation from those values.  Additional “computation” beyond And/Or/Not conjunctions in Population measure section may not desirable or possible in HQMF. Note: This is under discussion as AND/NOT elements tend to be exclusions, exceptions, or clarifications of a specific inclusion element and as such will need some mechanism for expression. | This is solved in the HQMF enhancements using the data criteria elements and then referencing them in population criteria elements. | Ready for Pilot feedback. | Keith Boone |
| Support queries for either patient or population-level responses | Certain use cases (particularly involving public health and welfare) may require aggregated data sets as a response to a query as well as individual patient-level responses. The standard should support queries for either or both level of information | Query Health Technical approach will accommodate both QRDA Category II and QRDA Category III.  So a new element in the HQMF document called resultType is suggested to be added which is an optional element. | Ready for pilots and Testing. |  |
| Ability to return/count encounters vs patients |  | Not required for pilots currently | Explored as part of pilots and testing. |  |
| Single vs Multiple Queries |  | Multiple Population criteria elements are possible currently | Ready for pilots and testing. |  |

Table - Proposed HQMF Enhancements – Status as of April 2012

# Appendix B - Acronyms and Definitions

The list of acronyms and definitions used in this implementation guidance are outlined below:

|  |  |
| --- | --- |
| CDA | Clinical Document Architecture |
| Center for Medicare and Medicaid Services (CMS) | US federal agency which administers Medicare, Medicaid, and the Children's Health Insurance Program. |
| Continuous Variable | A measure score in which each individual value for the measure can fall anywhere along a continuous scale (e.g., mean time to thrombolytics which aggregates the time in minutes from a case presenting with chest pain to the time of administration of thrombolytics). |
| Denominator | The lower part of a fraction used to calculate a rate, proportion, or ratio. The Denominator is a subset of the Initial Patient Population, grouped for inclusion in a specific performance measure based on specific criteria (e.g., patient's age, diagnosis, prior MI). Different measures within a measure set may have different Denominators (e.g. measure #1 Denominator = Initial Patient Population AND Smoker; measure #2 Denominator = Initial Patient Population AND Atrial Fibrillation). (Can have inclusion and exclusion criteria). (Continuous Variable measures do not have a Denominator, but instead define a Measure Population). |
| Denominator Exception | Cases that meet the Denominator criteria and do not meet the Numerator criteria can be counted as Denominator Exceptions if they meet the Denominator Exception criteria. Cases in the Denominator that meet the Numerator criteria are not counted as Denominator Exceptions. Denominator Exceptions are the valid reasons for patients who are included in the denominator population, but for whom a process or outcome of care does not occur. Patients may have Denominator Exceptions for medical reasons (e.g., patient has an egg allergy so they did not receive flu vaccine); patient reasons (e.g., patient refused flu vaccine); or system reasons (e.g., patient did not receive flu vaccine due to vaccine shortage). These cases are removed from the denominator for the performance logic; however, the logic can indicate the number of patients with valid exceptions for reporting. |
| DSTU | Draft Standard for Trial Use |
| Health Level Seven (HL7) | HL7 is a non-profit organization involved in development of international healthcare informatics interoperability standards. |
| hQuery | hQuery is an open-source implementation of a framework for distributed query of health data. |
| i2b2 | i2b2 (Informatics for Integrating Biology and the Bedside) is an NIH-funded National Center for Biomedical Computing based at Partners HealthCare System. |
| Initial Patient Population | This identifies the eligible group of patients that the performance measure is designed to address; usually focused on a specific disease process (e.g., coronary artery disease, asthma). Details could include such information as specific age groups, diagnoses, diagnostic and procedure codes, enrollment periods, insurance and health plan groups, etc. For example, a patient aged 18 years and older with a diagnosis of CAD who has at least 2 visits during the measurement period. The Initial Patient Population is the same across all quality measures within a single quality measure set. All patients counted (e.g. as Numerator, as Denominator), are drawn from the Initial Patient Population. (Can have inclusion and exclusion criteria). |
| IHE | Integrating the Healthcare Enterprise (IHE) is an initiative by healthcare professionals and industry to improve the information sharing and interoperability of healthcare systems. |
| IHE SVS Profile | IHE Sharing Value Sets (SVS) profile provides a means through which healthcare systems producing clinical or administrative data can receive a common, uniform, centrally managed nomenclature. |
| NQF | NQF is a non-profit organization involved in the development and implementation of a national strategy for health care quality measurement and reporting. |
| NQF QDM | The NQF Quality Data Model (QDM) is an information model that defines concepts used in quality measures and clinical care, and is intended to enable automation of electronic health record (EHR) use. |
| Numerator | The upper portion of a fraction used to calculate a rate, proportion, or ratio. For a Proportion Measure, the Numerator is a subset of the Denominator, which defines the group of patients in the denominator for whom a process or outcome of care occurs (e.g., flu vaccine received). |
| QRDA | Quality Results Document Architecture |
| Query Health CEDD | The Query Health Clinical Element Data Dictionary (CEDD) serves as a clinical data dictionary that describes the data elements, the relationships of these data elements, possible datatypes for the elements, and how they are used in support of a specific query (for example, usage in a computation or measure). |
| PopMedNet | PopMedNet enables creation, operation, and governance of distributed health data networks. It facilitates distributed analyses of electronic health data to support medical product safety, comparative effectiveness, quality, medical resource use, cost-effectiveness, and related studies. |
| RIM | Reference Information Model (RIM) is an information model for health care data developed by Health Level 7 International (HL7) |

Table - Key Acronyms and Definitions from HQMF

1. SubstanceAdministration is for administration of the medication, supply for ordering a quantity of it for a patient (e.g., for self-administration). [↑](#footnote-ref-1)